INSTITUTE OF PETROLEUM REVIEW

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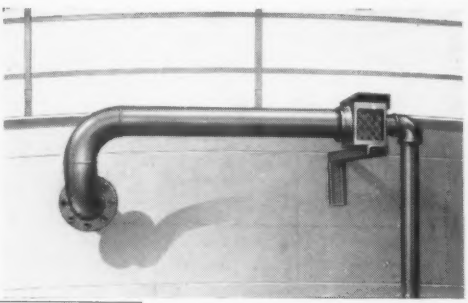

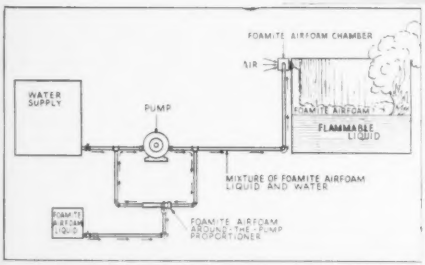

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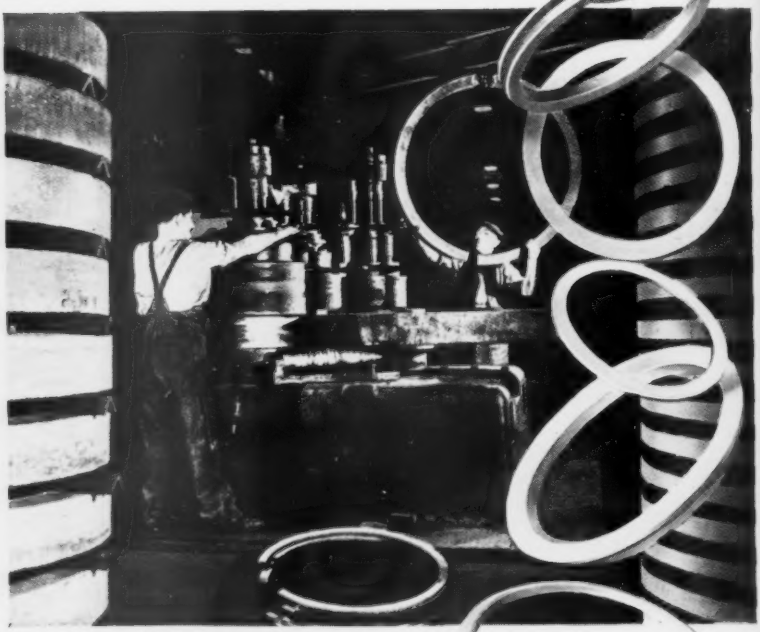

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THE PETROLEUM-CHEMICALS INDUSTRY IN THE U.K.*

By H. K. WHALLEY†

Introduction

A balanced picture of the petrochemicals industry in the U.K. can only be obtained if the British effort is viewed in perspective and judged against the background of the whole range of chemical industry. If a petroleum chemical is defined as one in the manufacture of which a petroleum hydrocarbon is used as an essential raw material, then this new industry embraces the whole field of organic chemistry, and its limbs extend even into the inorganic fields, such as in the production of hydrogen, ammonia, ammonium nitrate, hydrochloric acid, and carbon black.

It is not surprising that the beginnings of the petroleum-chemicals industry should have been in America, where the exploitation of her oil resources (both petroleum and natural gas) was highly developed, and where substantial oil-refining capacity was installed.

In Great Britain, with its negligible oil resources, it is only since the war that official circles and the major oil companies have seen the wisdom of those few pioneers of oil-refining who preached, and indeed practised their own doctrine that petroleum refining was a valuable, if not essential industry for the country's economic health. The expansion in refining capacity now

*Summary of paper read before Northern Branch at Manchester on 20 November 1951.

†Petrocarbon Ltd.

TABLE I
U.K. REFINING CAPACITY

		Through-put 1948	*Through-put* 1952-3
		(000 metric tons)	
Shell	Heysham	1,500	1,851
	Ardrossan	200	155
	Shellhaven	400	2,289
	Stanlow	400	3,482
A.I.O.C.	Pumpherston	100	173
	Llandarcy	1,000	2,723
	Grangemouth	500	1,588
	Shoreport	—	4,000
Esso	Fawley	1,000	6,190
M.O.R.	Manchester	100	122
Lobitos	Ellesmere Port	100	152
Berry Wiggins	Kingsnorth	100	65
	Weaste	—	54
William Briggs	Dundee	—	34
Vacuum	Coryton	—	425
	TOTAL	5,500	23,303

taking place (see Table I) will mean the increasing availability of raw materials for a petroleum-chemicals industry and opens the path to a full and rapid development.

This development is considerably helped by the advances made during the past twenty years in "conventional" oil refining techniques. Such processes as alkylation and polymerization used for the production of high-octane gasoline, can be adapted for the production of important petroleum-chemicals, e.g. styrene and propylene tetramer.

PETROLEUM-CHEMICALS IN THE U.S.

To-day, the petroleum-chemicals industry in the U.S. is conducted by chemical companies, petroleum companies, and alliances between both petroleum and chemical companies, but the initial development was done by Carbide and Carbon Chemicals Corporation, a firm that had no direct ties with the petroleum industry. Its growth can be appreciated by the fact that whereas 25 years ago practically the whole aliphatic organic chemicals production was from coal or vegetable products, to-day about 80 per cent is derived from petroleum. To-day, also, the increased demand for aromatics, particularly benzene, has led to large-scale plans being made for benzene production, by both old and novel methods, from petroleum.

Thus, although in 1950, coke ovens supplied about 540,000 tons of the total U.S. requirement of 615,000 tons, estimates for future requirements far outrun the expected expansion of production of benzene from coal (the expected 1953 production from this source is 590,000 tons), and the petroleum-chemicals industry plans to expand its output of benzene from 40,000 to 300,000 tons p.a. Part of this increased demand may of course be attributed to the rearmament programme, but even if this were discounted, it is probable that the demand in 1952/3 would be in the region of 850,000 tons, and by 1955 would reach the million tons p.a. mark.

The entry of petroleum into the field of chemical industry is leading to a pronounced change in the character of the industry. Organic products which formerly had relatively low-volume uses are now produced in much greater quantity, and are being readily absorbed in the manufacture of synthetic fibres, synthetic detergents, synthetic rubber, etc.

The production of synthetic fibres is rising rapidly: nylon production in the U.S. is now about 50,000 tons p.a. and is still expanding; the new fibres, Terylene (fibre V), Orlon, Dynel, and others are expected to bring the American synthetic fibre production up to 200,000 tons p.a. within the next three years. Synthetic detergent sales have risen from about 10,000 tons p.a. in 1939 to 500,000 to 600,000 tons p.a. in 1950, or about one-third of the total production of conventional soaps.

Available statistics of the utilization of *n*-butene and *iso*butene are probably less reliable, but they indicate that some 300,000 to 400,000 tons of *n*-butene are consumed annually, the major part of the demand being for butadiene manufacture, and that about 50,000

TABLE II

U.S. PRODUCTION OF PETROLEUM-CHEMICALS*

UNITS: TONS OF OLEFINS CONSUMED

	1940	1945	1948	1949	1950
Total ethylene conversion products	165,000	344,000	473,000	571,000	643,000
Ethylene oxide	56,000	92,000	150,000	179,000	214,000
Ethyl alcohol	67,000	120,000	160,000	200,000	214,000
Ethyl benzene		52,000	48,000	49,000	51,000
Ethyl chloride	21,000	29,000	36,000	39,000	41,000
Ethylene dichloride	4,000	25,000	34,000	39,000	40,000
Polyethylene		3,000	8,000	24,000	36,000
Total propylene conversion products	86,000	205,000	328,000	394,000	394,000
*Iso*propyl alcohol	72,000	161,000	273,000	328,000	328,000

*Aries and Copulsky, *Chem. Engng.* Aug. 1950—p. 116

to 60,000 tons of *iso*butene are converted into butyl rubber.

This has been only a brief glimpse of the American scene, but with this picture in mind the significance and trend of the U.K. petroleum-chemicals industry can be better assessed.

THE PETROLEUM-CHEMICALS INDUSTRY IN THE U.K.

Closeness of the Parallel

Though it is to be expected that the petroleum-chemicals industry in the U.K. should follow a parallel course to that of its U.S. forerunner, there are a number of factors which require or encourage deviations from a blindly repetitive version of the U.S. industry.

First, since the U.K. has no significant natural gas or oil resources, the petroleum-chemicals industry must be based on imported raw material; i.e. the raw material must either be imported as such or must be obtained from U.K. refineries. That is why the development of the U.K. petroleum-chemicals industry is closely linked to the refinery expansion programme mentioned in Table I.

Secondly, the U.K. market differs in both type and size from that of the U.S.A. The U.K. population of about fifty million is one-third of that of the U.S.A., but industries are not in the same proportion: the motor industry, for example, is only 1/15th of that of the U.S., and the synthetic rubber industry is non-existent. Further, in the development of uses of certain petroleum-chemicals (for example, ethylene oxide) Britain has lagged behind America because manufacturers have been starved of these intermediates.

Thirdly, though U.K. petroleum-chemicals development is in part in the hands of two of the major oil companies, whose ways of thinking and acting transcend geographical and political boundaries, a substantial proportion of it is a British rather than an international or U.S. development. There are many advantages in living on a small island, peopled by a race distinguished by the independence and originality of its thought, fertile in its inventiveness. These factors are conducive to industrial developments which are more than a copy of American processes.

The Firms Engaged

The first plant in the U.K. to use the cracking of an oil fraction for the production of chemicals was that of British Celanese: little information is available, but since 1942 certain intermediates (acetic acid, acetone) used in the production of rayon and plastics, have been made in this way. Since

that time, four major companies have entered the U.K. petroleum-chemicals industry; British Petroleum Chemicals Ltd, Imperial Chemical Industries Ltd, Petrochemicals Ltd, and Shell Chemical Manufacturing Co Ltd.

British Petroleum Chemicals Ltd is owned jointly and in equal partnership by the Anglo-Iranian Oil Company and the Distillers Co Ltd. An associated company, Forth Chemicals Ltd, is owned two-thirds by British Petroleum Chemicals Ltd, and one-third by Monsanto Chemicals Ltd, and is building a plant for the production of monostyrene (approx 8000 tons p.a.) at an estimated capital cost of about £1.3 million. Doubling the throughput is scheduled.

The site of the B.P.C. works is at Grangemouth, adjacent to A.I.O.C. subsidiary, Scottish Oils Ltd, to which it is linked by a pipeline. The capital cost of the first stage of development exceeds £5 million and approval by E.C.A. has been given for a loan of $6.5 million. The dollar element for the completed plant is said to be $17 million.

The raw material for the works will be naphtha from Scottish Oils Ltd. The feed-stock, mixed with steam, will be cracked in tubular furnaces, with the prime object of obtaining olefins; the liquid products and other unwanted cracking products (over and above those required for chemical conversion or for fuel) will be returned to Scottish Oils Ltd. By varying the conditions of operation (e.g. temperature, contact time) the amounts of the different olefins obtained can be changed.

No data have been published on the proposed throughput of the Grangemouth plant but it might well be in the region of 300,000 tons p.a. Ethyl alcohol and isopropyl alcohol plants are already in production.

Imperial Chemical Industries Ltd. The prime motive for the I.C.I. installation of oil-cracking equipment at Wilton is evidently the desire to turn to petroleum as an alternative to coal as a source of basic raw materials, and its entry into the petroleum-chemicals field does not spring, as it does with its competitors, from a wide experience of the petroleum industry.

The I.C.I. development scheme at Wilton is, of course, fully integrated with the company's other activities. Expenditure on the Wilton project, which includes additional facilities for soda and chlorine production, was estimated in 1949 to be £22 million, of which perhaps £17 million may be attributed to the expansion based on oil-cracking.

The I.C.I. cracking plant, which is likely to have a throughput of 250,000 tons p.a., will allow production of about 25,000 tons of ethylene derivatives and a similar quantity of acetone. The naphtha feedstock is pyrolized by superheated steam, the gas stream is treated to remove hydrogen sulphide and moisture, and the acetylene present is catalytically hydrogenated to ethylene. Hydrogen and methane will probably be piped to Billingham for hydrogen production; ethylene will be used to produce Polythene and ethylene oxide. Further uses of ethylene lie in the manufacture of ethyl alcohol, synthetic detergents and Terylene. Propylene is to be used for the manufacture of *iso*propyl alcohol (thence acetone) and Perspex (at Billingham). The C_4 fraction will be used for octane improvement of the petrol now produced at Billingham, as well as sold in the form of bottled gas.

Petrochemicals Ltd is closely associated with the Manchester Oil Refinery Group of Companies. The Petrochemicals project was conceived, and is now operative, as a group of processing plants producing a wide range of basic aromatic and aliphatic chemicals as a nucleus around which secondary plants for the further processing of these basic products would be built. The project was founded upon the Catarole

process for the simultaneous production of olefins and aromatics by the cracking of petroleum distillates.

Petrocarbon Ltd is the research, design, development and construction company of the group, and though it is of relatively recent (1945) formation, members of its management and staff were closely connected with the construction of a number of refineries in Europe, including Albatros Belge S.A., Manchester Oil Refinery Ltd, Aquila S.A. More recently, Petrocarbon Ltd was responsible for the research, development and construction of the group of plants now operated by Petrochemicals Ltd and its associates, and is now the chief consultant to Condor S.p.A. In collaboration with Scientific Design Company, New York, Petrocarbon has developed a process for the production of ethylene oxide by the direct oxidation of ethylene.

Petrochemicals Ltd and Erinoid Ltd formed a joint company—Styrene Products Ltd—for the manufacture of polystyrene: production began in November 1950. A second joint company with Lewis Berger Ltd, i.e. Styrene Co-Polymers Ltd, is engaged in the manufacture of styrenated oils and resins; and a third joint company with Lankro Chemicals Ltd, namely Oxirane Ltd, markets certain ethylene oxide derivatives, including glycol ethers and ethanolamines. The capital of Petrochemicals Ltd exceeds £10 million. The dollar element of capital expenditure was less than 1 per cent of the total.

Petrochemicals Ltd has, therefore, close ties with both the petroleum and certain chemical industries. Though all the plants referred to above are operating and thereby carrying the Petrochemicals project through to the second stage of development, it is to be expected that the future will bring increased diversification of the intermediate organic chemicals that are Petrochemicals Ltd's primary products.

Whereas the other major petroleum-chemicals projects have chosen the American vapour-phase cracking process, with steam, as their basis, Petrochemicals has, since January 1949, successfully operated the novel Catarole process. Typical yields when operating on Middle East naphtha, are given in Table III, where, for comparative purposes, the yields believed to be obtained from conventional vapour-phase steam cracking are also given.

TABLE III

TYPICAL CRACKING YIELDS—% W/W ON CHARGE (NO LOSS BASIS)

Gases	*Catarole*		*Conventional cracking*		
Hydrogen	0.5		0.4		
Methane	16.0		8.5	28*	
Ethylene	12.5		14.1		
Ethane	9.5		4.9		
Propylene	10.0				
Propane	1.5			17	
C_4's	3.0			11	
		53.0			56
Liquids					
Up to 200 C	27.0			19	
200-300 C	8.0			25	
Above 300 C	12.0				
		47.0			44
		100.0			100

*Messrs E. B. Badger & Sons (Gt Britain) Ltd were good enough to supply a fairly representative analysis of the C_2 and lighter fraction: they also confirmed that the other yields quoted for conventional cracking were, in their view, of the right order.

Important features of the Catarole process are the very high aromatic content (over 90 per cent) of the liquid products, from which the isolation of pure aromatics (benzene, toluene, xylene, xylene-styrene mixture, alkyl naphthalenes, etc.) is relatively simple; also, the fractions, particularly in the 140° to 210°C range, are rich in polymerizable compounds (styrene, indene, methyl styrene) from which both oil-soluble and oil-resistant resins, of excellent light stability and high melting points, are produced.

The Petrochemicals gas conversion plants produce *iso*propyl alcohol from propylene, and ethylene oxide from the ethylene. The ethylene oxide is converted to ethylene glycol, glycol ethers and ethanolamines, or is marketed as such. The tail gas (ethane,

methane, and hydrogen) augments Manchester's supply of town gas. The engineering aspects of the project have been very fully described already in the literature.

Shell Chemical Manufacturing Company Ltd. The Stanlow plant is the product and the embodiment of the research, knowledge and experience gained over more than twenty years by the Royal Dutch/Shell group throughout the world. The associated companies of the group are currently expending about £6 million per annum on research over a wide range of the petroleum and petroleum-chemicals field, including such subjects as gas turbine engines, lubricants, insecticides, fungicides, plant growth-regulating compounds, synthetic detergents, glycerol and solvents.

The history of Shell's Stanlow refinery began with the installation in 1922 of discharge and storage facilities for oil cargoes. A bitumen plant was added shortly afterwards, and then means for the production of petroleum spirit (S.B.P. spirit). In the late thirties, further enlargements to the refinery were made, including plant for the production of *iso*-octane, and, during the early days of the war, lubricating oil plants were installed. In 1942, production of Teepol—a sulphated secondary alcohol, made by the sulphation of olefins obtained by the cracking of by-product wax from lubricating oil manufacture—was started, and now the plant capacity for this product is over 60,000 tons p.a.

As is well-known, Stanlow refinery is being enlarged, and its capacity when completed will be about $3\frac{1}{2}$ million tons p.a. From this enlarged refinery, the production of gases from the catalytic cracker will be substantial, and these will be used as the raw materials for chemical conversions. Pending the completion of the refinery extensions, and therefore of the supply of olefins from the catalytic cracking unit, Shell have installed two thermal crackers, operating on gas oil at a throughput of about 100,000 tons p.a., to give the necessary gases, and conversion plants for the manufacture of a range of solvents. The plant has been in operation since 1949. The capital cost of this petroleum-chemicals project has been stated to be £4 million. The approximate yields obtained and the uses of the primary products are given in Table IV.

TABLE IV

PRODUCTS AND USES OF SHELL CRACKERS

Product	% w/w	*Use*
C_2 and lighter	28	Fuel, dichlorethane,* ethyl chloride*
C_3's	17	Propylene: for isopropanol thence to acetone (5,000-6,000 tons p.a.) and hydrogen; thence to diacetone alcohol, mesityl oxide, and methyl isobutyl ketone. Propane: to fuel
C_4's	11	Butylene: for secondary butyl alcohol, and thence to methyl ethyl ketone and hydrogen.
C_5's (recycled) Light distillate	19	Part used as absorber oil in gas separation plant, and part, after hydrogenation, for motor fuel.
Heavy fuel oil	25	Fuel.
	100	

From the 100,000 tons gas oil charge stock, about 20,000-24,000 tons p.a. of solvents (excluding ethylene derivatives) are obtained.

**Economist*, 1.9.51, p. 523.

THE COMBINED EFFORT

The present capital investment in the British petroleum-chemicals industry is approximately £40 million. Although this is only the beginning of the programme, it compares with the proposed new investment, in 1949, of £3.6 million for nitrogenous fertilizers, £7.1 million for pharmaceutical and veterinary products, £16.3 million for dyestuffs, £22 million for plastics and synthetic resins, £43 million for heavy organic chemicals. It should be noted that the figures for the two latter industries contain a large proportion of petroleum-chemicals investment.

The annual throughput of British petroleum-chemicals plants will be approximately 500,000 to 800,000 tons,

i.e. 3 to 5 per cent of the total consumption of petroleum. These figures apply to the four major petroleum-chemicals plants which are all situated in the north of Great Britain.

This represents a good beginning for the British petroleum-chemicals industry, especially in the production of aliphatic compounds. Though full information is not available, it is estimated that, from petroleum-chemicals sources, ethyl alcohol production will be augmented by not less than 35,000 tons p.a. The production of chlorinated solvents derived from ethylene may be of the order of 10,000 to 20,000 tons p.a.; ethylene oxide production (for glycol, Terylene, detergents, ethanolamines, glycol ethers, etc.,) will be in the region of 30,000 to 40,000 tons p.a.; monostyrene not less than 16,000 tons p.a.; *iso*propyl alcohol, acetone, and their derivatives 60,000 to 70,000 tons p.a.; C_4 derivatives perhaps 10,000 tons p.a.

In the case of aromatics, only Petrochemicals Ltd is adding to the U.K. production: this company is producing approximately 30,000 tons p.a. of benzene, toluene, xylene, aromatic solvents, and resins.

In a country with vast coal resources and an annual production from coal of about 300,000 tons of crude benzole, and 500,000 tons of other coal tar solvents (toluol, xylol, aromatic solvents, naphthalene, etc.) it may seem unnecessary to be concerned about the supply of aromatics. However, the annual requirements are steadily rising and efforts are being made to increase production by the gas industry, the Coal Board, other coke-oven plants, tar distillers, and the Iron and Steel Corporation.

Again, the increased production of polystyrene, Terylene, the expanding range of cyclic plastics and resins, and the possible establishment of a U.K. synthetic rubber industry would greatly enhance the demand for benzene, ortho- and para-xylene, phenol, phthalic anhydride, naphthalene, etc.

The pattern of the future may also be modified by the production, in the new refineries, of large quantities of gases. While a large proportion of these may be used as fuel, C_4's will also be used for gasoline improvement and plants may be erected for the production of poly-gasoline and alkylate. In addition, these gases may provide the starting-point for butyl rubber manufacture, and for synthetic rubber (GR-S) production, *via* butadiene.

The total value of all these petroleum-chemicals will amount to approximately £30 million per annum and this total will rise as secondary and tertiary plants are erected. At the same time the ratio of revenue to capital investment, which is at present rather low, will steadily increase.

Another way of looking at the petroleum-chemicals programme is to consider the value of the raw material in relation to the value of production for each man employed. Each ton of naphtha or gas oil, costing approximately £12 to £14 per ton, yields products worth £50, and each man employed makes, with the help of large-scale organizations and plants, goods worth £5,000 to £10,000 per year.

Flexibility

The precise form of future development cannot at present be forecast and there is a measure of flexibility in the existing plants which allows growth of demand and changes of emphasis to be coped with.

However, the term "flexibility" is often misunderstood. The basic process, e.g. cracking, may have considerable flexibility, depending on charge-stock, design, cracking conditions, etc. But in any integrated works, the cracking plant will feed a series of more or less fixed-capacity plants and, as the complexity of the interlocking series of plants develops, so flexibility of the

whole is limited—if existing plants are to be used economically and to full capacity.

Flexibility can, indeed, be bought. It may be obtained, for example:

(a) by capital investment on installing spare capacity to meet possible increases in demand. If this spare capacity is not used at all times, then the costs of maintenance and amortization have, in fact, to be borne by other products of the works.
(b) by robbing one process plant to feed another. In this event, obviously, the robbed plant is operating at less than its nominal capacity, and its products have to carry, per ton, increased fixed charges and possibly increased direct costs.
(c) by producing (and using any spare capacity available) additional amounts of a particular feed-stock. If, say, spare capacity is available for the manufacture of *iso*propyl alcohol, then the increase in production of propylene to fill this spare capacity is most likely to involve changes in the production of other feed-stocks (for example ethylene, butylene) which supply other plants. These other plants, therefore, will either be starved of their feed-stocks or—unless these plants also have spare capacity—valuable feed-stocks will be over-produced and will have to be directed to lower value uses (for example, fuel) or wasted.

All these variations on the theme of flexibility cost money, and it is because of this that the preliminary planning of the four projects has called for careful thought. When considerable investment is involved, caution tends to be dominant, and the scope and size of the petroleum-chemicals works is likely to be determined by what is thought to be the sure and certain demand for its products. It is, therefore, not surprising that the capacities of certain plants planned some years ago are now seen to be modest and most probably inadequate for future needs.

Scale and Complexity

Selecting the extent of diversification of products presents a difficult problem to the new entrant into the petroleum-chemicals industry. In the United States, for example, Standard Oil Company (New Jersey) carries conversion only to the stage where marketable liquids are produced in bulk. The Shell Chemical Corporation, on the other hand, carries out successive conversions to make a wide range of consumer commodities.

The governing factor is the scale of operations undertaken in the particular plant, for cost is progressively reduced with increasing quantity, the curve relating throughput with cost per ton gradually flattening at higher throughputs. Provided an efficient company produces a first conversion product on a large enough scale, it can compete successfully with smaller producers.

If, however, the first conversion product is produced in relatively small quantities (and, therefore, at higher production costs compared with larger competitors) further conversion to produce a range of secondary and tertiary products on a relatively large scale becomes profitable. It should be remembered, however, that this picture may be modified by other factors such as operational efficiency, the development of new processes and new markets, the establishment and exercise of monopolies and straightforward salesmanship.

The U.K. picture shows the effect of all these and other complexities: for example, though I.C.I. are producing petroleum-chemicals in a large measure to augment the requirements of their existing industries, they will add not only to the quantity of existing products but also to the diversity of the new. Similarly, British Petroleum Chemicals will be bulk producers of first conversion products (for example ethyl alcohol and *iso*propyl alcohol) for their own and their associates' requirements, but vertical development is also to be expected. The policy of both Shell and Petrochemicals Ltd is apparently to carry the utilization of primary products far down the line of elaboration and diversification.

The 10,000-barrel fluid catalytic cracker at the Llandarcy refinery of National Oil Refineries Ltd which is being erected under the supervision of the Kellogg International Corporation. When this picture was taken in mid-June the unit was more than 85 per cent complete.

★ ★ ★

LONDON BRANCH DANCE

For the third consecutive year the theatre at Manson House is to become a flower-banked ballroom, when on Friday, 14 November, the London Branch again hold their Annual Dance.

Eric Lambert's dance orchestra, who have contributed so much to the success of the previous occasions, have again been booked, and the tickets at 10s 6d each include buffet refreshment.

There will be a licensed bar, and dancing will continue from 8 p.m. until midnight. Evening dress will be worn.

Those who only know Manson House in its more formal setting for the presentation of scientific papers, may find it difficult to believe how charming and luxurious Manson House can look when it is dressed up for a ball.

Members of the Institute who are not members of the London Branch and their friends are very welcome.

Tickets are obtainable from the General Secretary, 26 Portland Place, London, W.1, or from any of the London Branch Committee, and it is particularly requested that a remittance should accompany the application.

Tickets are limited, and early application is advised.

WORLD PETROLEUM CONGRESS 1955

The Permanent Council of the World Petroleum Congress has invited the Institute of Petroleum to form a British National Committee for the 4th Congress, which is to be held in the early summer of 1955 in Italy, probably in Venice.

This invitation has been accepted and the following Committee has been formed:

H. S. Gibson, C.B.E.
Col. S. J. M. Auld, O.B.E., M.C.
C. Chilvers
T. Dewhurst
Dr E. B. Evans
Prof. F. H. Garner, O.B.E.
H. Hyams
W. H. Thomas
G. Sell
Secretary—D. A. Hough

★ ★ ★

Pakistan Oil Search—Pakistan Petroleum Ltd, to commemorate five years (14.8.47 to 14.8.52) of prospecting activity, has recently issued a small illustrated booklet. After a brief account of how oil is won, an outline is given of activities in Punjab, Sind, Baluchistan, and East Pakistan.

VACUUM OIL'S NEW REFINERY

The tanker Pericles approaching Coryton No. 1 jetty with the first cargo of crude oil.

In his statement accompanying the Directors' Report for 1951, J. C. Gridley, C.B.E., chairman of Vacuum Oil Co. Ltd., said in regard to the new refinery at Coryton, Essex, that despite serious difficulties and delays in obtaining steel and other essential materials, very good progress had been made in its construction. He expressed the hope that some of the units would be in operation before the end of 1952 and that full production would be reached by the middle of 1953.

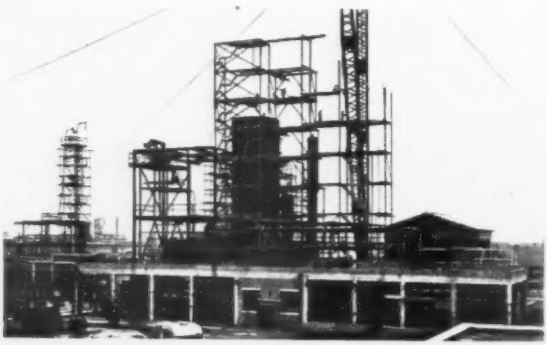
A recent visit to Coryton showed that the site of the new refinery was the centre of considerable organized activity, many of the refining units being in an advanced stage of construction. In fact, crude oil had already started to flow into the storage tanks, as the first cargo of 28,000 tons of Middle East crude was delivered during August, and was quickly followed up by a second cargo.

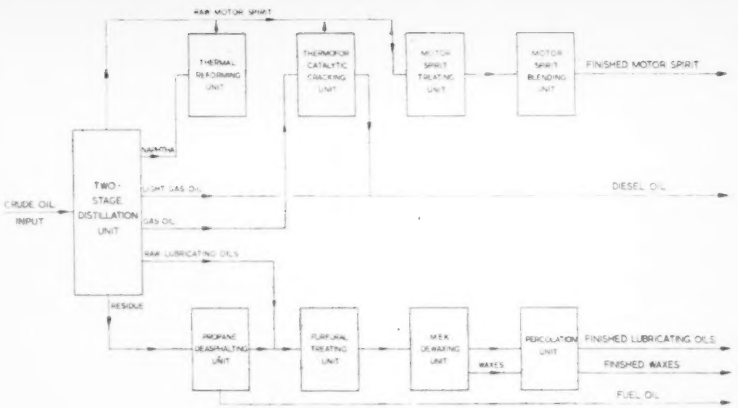
The Refinery

The designed throughput of the plant is about 900,000 tons of crude per year to produce lubricating oils, gasoline, diesel oil, fuel oil, and paraffin wax.

Crude oil will be fed to the two-stage-atmospheric and vacuum-distillation unit, from which six cuts will be taken—raw gasoline, naphtha, light gas oil, gas oil, lubricating oil, and residue. It is expected that the distillation unit and the thermal reformer and ancillary units will be in operation before the end of 1952.

The vacuum distillation column under construction.





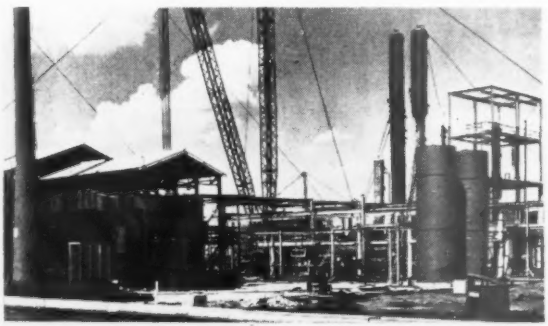
The process scheme at Coryton.

For the production of gasoline, three cuts—crude spirit, naphtha, and gas oil—will be utilized, the naphtha passing through the reformer and the gas oil through the catalytic cracker en route to the treating and blending units. The light gas oil cut and the residue from the cracking unit will be treated to produce a diesel oil.

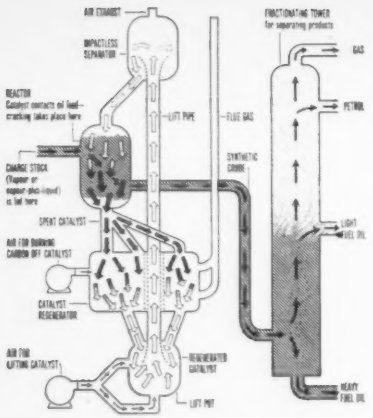
The lubricating oil fractions from the vacuum distillation column will be given four treatments—de-asphalting, solvent extraction, de-waxing, and percolation—to produce finished lubricants and waxes, and this part of the plant is expected to be operating early in 1953.

The Cat Cracker

The catalytic cracking unit under erection at Coryton is designed on the Air-Lift Thermofor process developed by the Socony-Vacuum Oil Co. Inc., joint proprietors with the Powell Duffryn Group of Vacuum Oil Co. Ltd. The Coryton unit is 272 ft in height and its foundations have entailed the sinking of nearly 400 steel and concrete piles. Its throughput will be 10,000 brl/day and the catalyst charge is 300 tons, requiring a make-up of about 2 tons/day. Catalyst is of the aluminium-silica-chrome type and it is understood that arrangements are in hand for



Progress in the construction of the furfural extraction plant for lubricating oils.



Simplified flow chart of the TCC unit.

it to be manufactured in Europe.

The operation of the Air-Lift TCC unit is shown in the accompanying simplified flow chart.

Ancillary Services

Coryton is located in the Thames estuary with deep water access for tankers of 30,000 tons dwt at any state of the tide, two jetties being available for tankers and barges. There is also a railway connexion to the main line of British Railways and road facilities are good.

The power plant which will shortly be in operation consists of three boilers to provide steam for three 5000-kW turbo-generators and for all process and heating requirements. The boilers will be fuelled mainly with propane tar, a by-product of the refinery.

Water requirements will be about one million gallons of fresh water daily for the boilers, and a large quantity of cooling water for process units and power plant. For the latter purpose, salt water will be drawn in from the water intake jetty and after use will be clarified before return to the Thames.

The normal maintenance and engineering shops, laboratory, administration offices, and canteen facilities are being erected.

The whole of the labour force, which at the time of the visit numbered between 3500 and 4000, and at least 95 per cent of the materials, plant, and equipment is of British manufacture.

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CORROSION AND TEMPORARY PROTECTIVES

Under the above title is published the fifth in Shell's series of technical booklets on specialized oils. Intended primarily for engineers and others concerned with the practical prevention of corrosion, Part I of the text is devoted to a brief survey of the mechanism of electrochemical attack. Following a general introduction, there is a chapter on atmospheric corrosion of engineering metals and suggestions for preventing corrosion in machinery.

Part II gives an account of petroleum base temporary protective coatings, chapters being devoted to their selection, application to external and internal surfaces, and removal. Descriptions are also given of laboratory performance, exposure and other tests.

The book has 17 figures, 7 of which are colour plates, and is available from any divisional office of Shell-Mex and B.P. Ltd.

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Soviet Chemical Journals. Complete English translations of the following four journals, which are not available in the original Russian on a subscription basis, are to be published by Consultants Bureau, 152 West 42nd Street, New York 18, N.Y., beginning with the 1952 volumes: *Journal of Analytical Chemistry of the USSR* ($80.00 per year); *Bulletin of the Academy of Sciences of the USSR, Divn of Chemical Science* ($80.00 per year); *Colloid Journal* ($80 per year); *Progress of Chemistry* ($95.00 per year).

COUNCIL COMMENTARY

A well-attended meeting of Council was held on 10 September—the first meeting of the new Session—the President being in the Chair. Members heard with regret of the death of H. de Wilde, Member of Council for six years, and stood in silence as a mark of respect.

One of the principal items of discussion concerned the 1953 Summer Meeting. After considering various venues and dates, Council decided to hold the meeting at Buxton 24-27 June 1953, Buxton being regarded as a convenient centre having regard to the distribution of Institute membership between London and the North West.

An impressive technical programme is being arranged on the theme: "The Post-war Expansion of the U.K. Petroleum Industry," and papers will be divided between four sessions held consecutively, each dealing with a separate aspect of the subject. Authors will be carefully selected for their knowledge of the particular fields and the papers should be of interest to members in all branches of the petroleum industry. Further information will be forthcoming when plans are more advanced.

The Election Committee have been studying ways and means of reducing the time that elapses between an application for membership and subsequent notification of election to the applicant. The names of those seeking membership of the Institute have to be published in the Journal before consideration by the Election Committee and an application may be delayed about a month if it is received just after an issue has gone to press. It is now suggested that the list of applicants should be printed separately, thus saving perhaps three weeks.

To broaden the basis of the Institute's activities, it has been proposed that various groups might be formed within the present general organization. Before the war, groups dealing with lubrication and with bitumen were operating very successfully. An *ad hoc* committee is studying this question and will be making recommendations to Council in due course. The present feeling is that the groups, if formed, should not be so narrow as those formed during the pre-war period.

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GEAR LUBRICATION SYMPOSIUM

At the 13 February 1952 meeting of the Institute, fifteen papers on the important subject of the lubrication of gears and the testing of gear lubricants were discussed. The papers and a full report of the discussion are reproduced in the August and September issues of the *Journal* of the Institute. For the benefit of those who wish to have the symposium as a separate publication, a few complete reprints will be available in one volume—price 15s each.

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LONDON BRANCH COMMITTEE

The officers of the London Branch for the current session are:

Chairman: A. W. Deller, D.F.C., A.M.Inst.Pet.

Vice-Chairman: H. G. Spence, B.Sc. (Eng.), A.F.Inst.Pet.

Hon. Secretary: R. F. Leach, M.A., A.F.Inst.Pet.

Hon. Treasurer and Membership Secretary: J. C. Jewell, B.Sc., A.R.C.S., A.R.I.C., M.Inst.Pet.

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DATES FOR THE DIARY

25 February 1953. IP Annual Dinner at Grosvenor House, London.

24-27 June 1953. IP Summer Meeting at Palace Hotel, Buxton.

PERSONAL NOTES

Robert Crichton, J.P., F.Inst.Pet., chairman of the Scottish Branch of the Institute, recently had conferred upon him the Honorary Fellowship of the Heriot-Watt College. At the formal presentation it was stated that, on the formation of Scottish Oils Ltd. in 1920, Mr Crichton was appointed general mining manager. In 1928 he became a director of the company, in 1930 general manager, and in 1941 managing director, a post he still holds with distinction. The award was made for his services to the shale industries in Scotland and for his deep interest in technological education of miners, engineers, and chemists.

Air-Comdre F. R. Banks, C.B., C.B.E., F.Inst.Pet., has been appointed Principal Director of Engine Research and Development at the Ministry of Supply and will be responsible for the Ministry's programme of aero engine research and development. He has been specially released from his position as technical manager of Associated Ethyl Co. Ltd. to take up this appointment. During the war, Air-Comdre Banks was Director-General of Engine Production and then Director of Engine Research and Development in the M.A.P. Recently he has been re-elected a vice-president of the British Internal Combustion Engine Research Association.

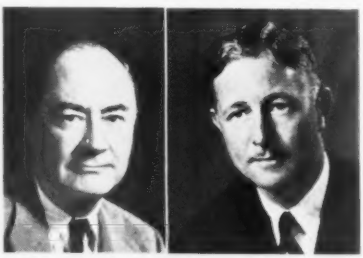
Miss E. M. Tanner, A.F.Inst.Pet., formerly spectroscopist with Esso Development Co. Ltd. at Abingdon, now occupies a similar post with Messrs Parke, Davis, & Co. Ltd.

Norman P. Biggs, has been appointed director of Esso Petroleum Co. Ltd. Formerly with the Bank of England, he became a director of Kleinwort, Sons & Co. Ltd. in 1947, a post which he has resigned to take up his new appointment.

Howard Page has resigned his directorship of Esso Petroleum Co. Ltd. in order to assume additional duties for Standard Oil Co. (New Jersey) in relation to European problems. He will retain his position as shareholders' representative for Standard in the U.K.

J. T. Tyson, M.C., B.Sc., Ph.D., has been appointed head of the Lubricants Research Section at Esso European Laboratories in succession to the late L. D. Derry.

W. F. Wackrill, director and general manager of Esso Transportation Co. Ltd., has been appointed a managing director, and **H. A. Wilson,** assistant general manager, has been appointed a director.



H. W. Sansom (left) has relinquished his position as manager of the Shipping Dept of Eagle Oil & Shipping Co Ltd to take up a post abroad. His successor is **S. G. Read,** assistant manager of the department since early 1951, who joined Anglo-Mexican Petroleum Co in 1924.

H. M. Davies, B.Sc., Ph.D., F.Inst. Pet., manager of laboratories of Vacuum Oil Co. Ltd since 1949 and previously a research group leader with Esso Development Co Ltd, joined Messrs Brown & Polson Ltd on 1 October. Dr Davies has long been an active member of the Institute's Standardization Committee and chairman of its Statistical Sub-Committee.

H. S. Humphreys, M.I.N.A., M.I. Mar.E., chief engineer superintendent of British Tanker Co. Ltd since 1942, died on 5 September at the age of 62. He joined the Company in 1921 as assistant engineer superintendent. He was responsible for the design, development, and construction of many new tankers up to the 32,000-dwt geared turbine vessels now under construction.

Esso Refinery Personnel

George Noble, O.B.E., J.P., B.Sc., F.Inst.Pet., has been appointed to fill the new post of General Manager of Refining recently created by Esso Petroleum Co. Ltd. at its head office in London. During the past twenty years Mr Noble has held responsible positions in the industry, including those of assistant process manager and of assistant maintenance superintendent at the Sarnia, Canada, refinery of Imperial Oil Co. At Fawley, he has successively been superintendent of technical services, assistant refinery superintendent, refinery general superintendent, and latterly refinery manager.

Frank Mayo, Ph.D., F.Inst.Pet., who succeeds Mr Noble as refinery manager at Fawley, has been actively connected with petroleum refining for seventeen years, having progressed at Fawley from plant chemist through the posts of superintendent of technical services, process superintendent, and assistant general superintendent, to that of assistant refinery manager.

D. A. C. Dewdney, B.Sc., F.Inst.Pet., new assistant refinery manager at Fawley, has been with the Esso organization since 1936 when, after several years as a chemist in a Middle East refinery, he joined the International Association (Petroleum Industry) Ltd. In 1949, after war service as a Staff Officer in the Directorate of Bomber Operations at the Air Ministry with the rank of Wing-Commander and for which he was awarded the U.S. Legion of Merit, Mr Dewdney became research manager of the Esso Development Co., and in 1951 was appointed co-ordinator of refinery operations.

URANIUM IN ESTONIAN OIL

To The Editor, *IP Review*

Sir,

The *Reviews of Petroleum Technology* for 1948 as published by the Institute of Petroleum has recently reached our library and eventually my branch.

One item on page 268 calls for some comment, as the implications are so important. This is the paragraph relating to the uranium content of Estonian oil shale. I realize that the reviewer of this chapter is a scientific reporter and has no way of checking the results reported in the technical journals which he reviews.

In this case the reference given is the *Chemical Age* for 18 September 1948, page 379, and a perusal of the article reveals the following language:

> "*Soviet Developments in Estonia*
>
> "*According to a report published in the old-established daily "St. Galler Tagblatt" the Soviet Russian authorities are paying great attention to the exploitation of the important oil shale deposits which occur in the former Republic of Estonia incorporated into the Soviet Union after the war.*
>
> "*These deposits have already been much fought over ever since methods for their exploitation became known. Nazi Germany coveted them chiefly because they yield a very pure oil fuel of special value for the propulsion of submarines and other vessels.*
>
> "*However, it appears that the importance of these deposits has been enhanced considerably by the fact that they are said to contain 200 grams of uranium per ton . . .*"

This reference has also been picked up by P. O. Krumin, *Ohio State University Studies Engineering Series*, vol. 28, No. 6, November 1949, Circular No. 50, Review of Estonian Oil Shale Industry, etc., who on page 90 draws the conclusion: "If so, then the large quantities of spent shale and shale ash dumped around the Estonian oil shale plants for decades, as a troublesome byproduct, will become a valuable and easily available source for extraction of uranium."

One of the chemists of my branch, Simon Klosky, who has spent considerable time in the study of European oil shale developments, including Estonia, believes this conclusion to be absolutely erroneous for the following reasons:

Oil shale occurs in several strata in Estonia, as shown by Lutz, and reproduced as Figure 53 in *Report of Investigations* 4776. The dark upper layer represents the kukersite and the lower dark layer the dictyonema oil shales.

Fossil contents and chemical analyses of these two shales are entirely different. These oil shales are further distinguished by the fact that the upper layer, kukersite, is rich in oil-yielding organic matter, while the lower layer, dictyonema is poor in oil-yielding organic matter. The lower layer contains potash, vanadium, and uranium (reported in the Russian technical literature), while the upper layer contains less potash and vanadium, but no uranium has been reported in any technical paper that has come to our attention.

Consequently it is not believed that the spent shale piles in Estonia are an extensive and easily available source of uranium. Discussion of this conclusion with geologists of the United States Geological Survey who are familiar with radioactive sediments has led to the view that it is unlikely that the kukersite contains significant quantities of uranium and that no reliable technical report of any appreciable amounts of uranium in the kukersite layer of Estonian oil shale has been published.

The inference that the spent shale piles in Estonia contain nearly half a pound (200 grams) of uranium per ton, leads to a very fantastic figure for the available uranium, since the Estonians have been producing oil shale at a steadily increasing rate from 1920 on. If the reported figure of two million tons in 1950 is accurate, their average

production would be about one million tons per year and the amount of available spent shale, possibly 30 million tons.

Anything you might do to dispel the impression that the spent shales in Estonia represents a potential source of large amounts of uranium would be appreciated.

R. A. CATTELL,
Chief, Petroleum and Natural Gas Branch,
Bureau of Mines,
U.S. Department of the Interior.

5 August 1952

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SEVEN MORE TANKERS FOR AIOC

The British Tanker Company, shipping subsidiary of Anglo-Iranian Oil Company Ltd., has placed orders for the construction of seven more large tankers, each of about 32,000 deadweight tons, at a total cost of over £12,000,000.

The Company already has 21 tankers (including six of 32,000 tons) under construction or on order. Its tanker fleet now in service totals 155 ships.

Two of the seven new ships will be built by John Brown & Co. Ltd, Clydebank; one by Cammell Laird & Co. Ltd, Birkenhead; one by Harland & Wolff Ltd, Belfast; one by Hawthorn Leslie & Co. Ltd, Hebburn-on-Tyne; one by Swan, Hunter & Wigham Richardson Ltd, Wallsend-on-Tyne; and one by Vickers-Armstrongs Ltd, Barrow-in-Furness.

The hulls will be similar to the six 32,000-ton ships already on order, but the double reduction geared steam turbine engines will be somewhat more powerful, producing 14,000 s.h.p. and giving an average speed of 15½ knots in service with full cargo.

These tankers will be 675 feet long, with a beam of 86 feet, and a summer draft of 35 feet. Although their size limits the number of ports where they can operate, it is estimated that these seven ships will be capable of providing greater service than 23 of the 12,000-ton vessels which were the largest type operated by the company before the war.

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REVISED OIL AGREEMENT WITH QATAR

Petroleum Development (Qatar) Ltd., announces the successful conclusion of negotiations with the Shaikh of Qatar for the modification of their Concession, to introduce the 50-50 principle now generally established in the Middle East. Under the modified Concession, the Ruler, Shaikh Ali bin Abdullah bin Qasim al Thani will receive half the profits accruing from the operations of the Company in his territory, instead of a fixed royalty as provided in the original Concession.

The original Concession granted by Shaikh Abdullah bin Qasim al Thani, father of the present Ruler, on 17 May, 1935, gave to the Company the exclusive right to search for, extract, and export, petroleum and natural gas for a period of 75 years and covering the whole of the Shaikh's domain. Production in 1950 and 1951 totalled respectively 1,700,000 tons and 2,300,000 tons and is now running at an annual rate of 3,000,000 tons.

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GERMAN CONFERENCE ON FAT CHEMISTRY

The 4th post-war annual meeting of the Deutsche Gesellschaft für Fettwissenschaft (DGF) was held in Düsseldorf on 6-10 October. The interests of the DGF are wide including biochemistry, soaps, detergents, paints and varnishes, waxes, etc. Details regarding DGF are obtainable from Dr L. Ivanovszky, 68 Park Street, Bridgend, Glamorgan.

ASTM/IP CO-OPERATION

Speaking at a meeting of ASTM Committee D-2 on 27 June 1952, H. Hyams, a vice-president of the IP and chairman of its sub-committee on Measurement and Sampling said: On previous visits to the U.S.A. I have devoted a fair proportion of my time to discussions which have led to the development of co-operation between the Institute of Petroleum and your Society in the field of standardization of petroleum test methods and oil measurement procedures. I am happy in the knowledge that much has been achieved by these close contacts, both here and in Europe, during the last six years. In the report which I presented to your D-2 Advisory Committee on Sunday last, that progress was most evident. Our joint accomplishments would not have been possible had there not been, at all times during our deliberations, a keen desire to "give and take", and a realization of the importance of our work to the petroleum industry. There is much still to be done; and there are others, too, who are interested in our efforts and who wish to join in it and make their contributions. On this matter, I feel I cannot do better than to quote the last section of my report to the Advisory Committee a week ago.

> "My final views are conveyed to you in all humility, but with the sincerity which I have felt, and I trust have conveyed, during the whole of the twenty years in which I have been devotedly attached to the cause of close collaboration between the activities of our two societies. Both of us, through our individual work and long experience in the framing of laboratory test methods, have a substantial contribution to make in the interests of our industry. The most valuable contribution will result from the fullest exchange of views between us and a willingness at all times to translate the word 'co-operation' in its most liberal sense. I repeat that the production of the joint oil measurement tables—a monumental task shared equally by out two organizations—is an example to the world petroleum industry of the true meaning of that word 'co-operation'. We are on the right road toward the ultimate goal—the maximum possible agreement between recommended test methods. Nothing should be permitted to interfere with that objective. We shall then be an example to others, taking them along with us, and profiting from their views and experience, so that in the ultimate we serve the real purpose of standardization—the smooth channelling of international trade—in this case, our petroleum industry."

Mr Chairman, I do not know whether I shall again be fortunate enough to visit you in ASTM before I retire from the industry. In addition, therefore, to thanking you all for the help you have given to me and the Institute of Petroleum in these six years, I am anxious to leave behind me the impression that, in my efforts and talks on this side, I have, at all times, conveyed that sincerity of purpose in the work and ideal of co-operation between our two countries to which I have so largely devoted myself in these last twenty years. Mr Gunn, at your recent annual dinner, described me as a trenchant speaker. On the type of work on which I have been engaged jointly with you, that may be a double-edged compliment. I hope and trust that such "qualities" as I may possess to warrant Bill Gunn's description of my speaking will, at no time, have led you to conclude that here is an Englishman who enjoys paying lip service to what he claims is his ideal of Anglo-American co-operation in petroleum standardization.

If this is to be the last opportunity I will have of speaking to you personally in this Committee D-2, the last thing I do want to say is to ask you to believe with me that, much as we have achieved, there is still much more that we can do to bring us into close harmony in the interests of the industry we serve and in the developments of the friendships we have formed in the course of our work.

And finally, Mr Chairman, may I say that, having an opportunity on this particular visit of seeing you all in action much more closely than ever before, how very much impressed I have been with the keenness that enters every phase of your wide activities and the volume of your achievements. You have gone a long way; there is still much to be done; and it is my earnest wish that, as the years go by, ASTM Committee D-2 will go from strength to strength in the execution of its admirable tasks.

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COMPANY PRODUCTION—CRUDE OIL

	July Tons	*August* Tons
Kuwait Oil Co. Ltd.	3,412,514	—
Iraq Petroleum Co. Ltd. (Kirkuk field)	1,151,274	1,560,413
Basrah Petroleum Co. Ltd. (Zubair field)	183,461	194,372
Petroleum Development (Qatar) Ltd. (Qatar, Persian Gulf)	272,061	274,110
	July Brl.	*August* Brl.
Trinidad Petroleum Development Co. Ltd.	303,971	297,508
British Controlled Oilfields Ltd.		
Venezuela		
Western Area	13,409	14,714
Central Area	15,780	14,612
Kern Oil Co. Ltd.		
California	109,831	110,404
Trinidad	70,452	69,155

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Motor Racing Successes.—Two recent publications by Shell-Mex & B.P. Ltd. are "Motor Racing Successes 1951" and "Motor Cycle Successes 1951". Each booklet gives factual and pictorial records and copies are available from any of the Company's divisional offices.

OIL COMPANY ORDERS IN THE U.K.

The Oil Companies Materials Secretariat furnish the following statement of orders placed in the United Kingdom by oil companies during the first and second quarters of 1952:

	Jan-March 1952	*April-June* 1952
Geophysical and other exploratory equipment, etc.	300	300
Specialized equipment for oil drilling and production, including oil casing, tubing, drill pipe, etc.	1,433,700	1,933,100
Specialized equipment for oil refineries, etc. (not including pumps and valves)	569,400	425,300
Drum and can-making, filling and cleaning equipment, kerbside pumps and other oil metering and dispensing equipment	469,200	334,500
Railcars, road tankers, aircraft refuellers, etc.	243,200	68,400
Drums, drumsheets, and tinplate	2,343,200	2,551,000
Tankage (including tank fittings	488,100	1,232,800
Tubulars, pipe fittings, and valves (ferrous and non-ferrous)	3,187,600	3,914,100
Pumps (excluding slush, oil-well and kerbside)	293,200	635,100
Boilers, boiler house plant and accessories, etc.	132,600	235,000
Electrical equipment—motors, generators, transformers, etc.	1,441,900	1,527,400
Instruments, meters, gauges, etc.	223,800	246,400
Prime movers and compressors	510,000	595,500
Machine and hand tools, welding and miscellaneous machinery and stores	1,899,300	1,991,000
Ferrous and non-ferrous plates, sections, sheets, and bars	1,044,900	1,143,600
Automotive equipment, all types	1,496,500	1,334,900
Laboratory equipment and chemicals, including hospital and medical supplies	124,400	152,900
Bulk chemicals, catalysts, barytes, etc.	4,466,900	1,648,800
Cement and other building materials and hardware, including timber	1,221,700	1,436,800
Commissary, general requisites for office, warehouse, household, club, and sports, etc.	878,200	1,054,300
	£22,468,100	£22,461,200

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"Basic Principles of Lubrication"—This Esso Petroleum Co. film, to which reference was made on Page 307 of our August issue, was recently awarded second prize in the scientific section of the recent Venice Film Festival. Its correct title is as above.

ILO PETROLEUM COMMITTEE

The Petroleum Committee of the International Labour Organization, consisting of delegates from fourteen oil-producing countries, is holding its fourth session at Scheveningen, Holland, 14-25 October. The chairman is Victor Montoya, Venezuelan Government member of ILO Governing Body.

Agenda for the session consists of three main items (1) General report, (2) Principles and methods used in determining wages in the petroleum industry, and (3) Social services in the petroleum industry.

Voluminous reports on each of the items have been prepared. Item 1 is covered by two reports, the first being a general report dealing with industrial developments and economic factors, with social and other aspects, and with hours of work in the industry. The second report under item 1 outlines the action taken by Governments and industry and by the ILO to implement the conclusions of the first three sessions of the Committee.

The report to be discussed under item 2 deals with the methods used in wage determinations in various countries, outlines the wage structure of the industry, and remarks upon additional payments to workers and cost-of-living allowances. It is concluded that there is scope for more careful choice of criteria for wage determination and points for discussion are suggested.

The third item concerns social services and the report to be submitted for discussion covers a wide field, including canteens and meals and cultural and recreational facilities.

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CONFERENCE ON CLAY TECHNOLOGY

The First National Conference on Clays and Clay Technology was held at the University of California 21-25 July 1952, the attendance being over 250. Twenty-six papers were presented and discussed covering all aspects of the subject from origin and occurrence to applications, including mineralogy, analysis and properties, reactions, particle size, and identification.

On the application side, the use of clay in the petroleum industry received much attention. Thus D. H. Larsen (*Los Angeles*) dealing with "Clay technology in drilling fluids" discussed the source, nature and properties of the clays and the chemical treatment of muds, while N. Johnston (*Montebello*) dealt with the "Role of clay in oil reservoirs" as a pertinent and important factor in reservoir behaviour. On the subject of "Clay technology in well log interpretation" M. R. J. Wyllie (*Gulf Research & Development Co.*) showed that a consistent shale baseline on a S.P. log indicated that shales under pressure behave as cation selective membranes. An electrochemical structure for shale is suggested.

W. L. Haden, H. M. Gwyn, and I. A. Cole (*Attapulgus Clay Co.*) reviewed "The use of clays in adsorption processes in refining of petroleum" and T. H. Milliken, A. G. Oblad, and G. A. Mills (*Houdry Process Corpn*) discussed "The use of clay catalysts for the cracking of petroleum". They dealt with the influence of the chemical composition and ionic structure of clays in relation to properties essential to cracking catalysts. The detrimental effect of certain impurities, particularly iron, were also discussed.

The full proceedings of the Conference are to be published by the State of California, Division of Mines.

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PROPOSED KARACHI REFINERY

The technical commission of the Burmah Oil Co., which earlier this year visited Karachi to investigate the practicability of building an oil refinery in that area, has presented its report to the Minister of Industries of the Government of Pakistan. The Government is now considering the project.

"DESERT HARVEST"

This 70-minute film of Kuwait and the oil development there was recently given its premiere in London. Introducing the film, which has been sponsored by the Kuwait Oil Company, Mr C. A. P. Southwell, the company's managing director, stressed the friendship that the company and the British and American members of its staff had always received from the Kuwaitis. This friendship had come from all classes, from the Shaikh to the lowliest unskilled worker in the oil operations, and he particularly welcomed the presence of a son of the Shaikh at the first showing of the film.

The film itself presents the story of Kuwait in an interesting and most attractive manner, glimpses of native life and customs being intermingled with shots of the oil operations. Thus, the viewer is reminded that there is also an active shipbuilding industry in the State and that pearl fishing is still carried on. For its import of essential goods, Kuwait depends upon the sea, as it also does for the exports of its oil, and these matters are not overlooked in the film.

The part and the interest which the native population takes in oil production is clearly brought out in this film and the importance of technical education to fit the Kuwaiti for higher responsibilities is illustrated.

The fact that the shots of the oil industry are never allowed to become too technical, adds much to the enjoyment of the film and to its understanding.

★ ★ ★

CHEMICAL WORKS SAFETY

The fourth Chemical Works' Safety Conference, organized by the Association of British Chemical Manufacturers, was held in Buxton in May of this year and was attended by 200 delegates. A 190-page book of the proceedings* has now been published. It includes the full text and discussion of the papers presented by L. J. Burrage (*Safety in the laboratory and on the plant*); J. S. Evans (*Toxic dusts in industry*); D. Matheson (*Relation between plant strength and dust explosion relief*); C. A. Beaton (*Safety in plant maintenance*); I. E. Baggs *et al* (*Safe transportation and storage of chemicals*).

*Price 7/6d. from the A.B.C.M. (Intelligence Officer), 166 Piccadilly, London, W.1.

★ ★ ★

EFFLUENT PURIFICATION

The problems which confronted Monsanto Chemicals in avoiding pollution through liquid wastes at their Ruabon, North Wales, factory, and an outline of the general manner in which these problems have been overcome, is described in a booklet titled "Effluent Purification". Well reproduced halftone photographs show various aspects of the project and a double-page diagrammatic plan of the plant lay-out is given.

★ ★ ★

"Hydraulic Systems"—No. 4 in Vacuum Oil Company's series of technical publications on lubrication is concerned with hydraulically-operated machine tools. This book of 60 pages is profusely illustrated and, after outlining the fundamental principles and the elements of hydraulic systems, deals with the application to machine tools and gives operating notes. The essential properties of hydraulic oils are also discussed.

The three previous issues dealt respectively with "Steam turbine lubrication", "Oil stores practice", and "Wire rope lubrication".

Copies are available from the Vacuum Oil Co., Caxton House, Tothill Street, London, S.W.1.

★ ★ ★

The Brush Aboe Group has formed a new "Petroleum Industry Division" under the managership of F. D. Langley, to act as liaison between the petroleum industry and companies in the group making electrical products and gas and oil engines. It will operate from Brush Aboe headquarters at Duke Street, London, S.W.1.

FREEDOM'S OIL

Copies of the address which Lieut. General Ernest O. Thompson, Texas Railroad Commissioner, delivered to the API on the occasion of the presentation to him of the API Gold Medal for Distinguished Achievement in November 1951 are available in illustrated booklet form from J. B. O'Connor, Dresser Industries Inc., Atlantic Building, Dallas 1, Texas.

In the course of his address, General Thompson said:

"The chances of finding even a very small oilfield (one which would supply the U.S. with oil for only four hours) are one in sixteen tries.

"The chances of finding a small (two days U.S. supply) field are one in fifty-three.

"The chances of finding a medium sized (one week U.S. supply) oilfield are one in three hundred and thirty tries.

"The chances of hitting a major (total production over 100 million barrels) oilfield are one in nine hundred and ninety one."

★ ★ ★

CHEMICAL ENGINEERING CONVENTION

The twenty-three papers delivered at the recent European Convention of Chemical Engineering during the XXV International Congress of Applied Chemistry in Frankfurt am Main are to be published in one volume of about 500 pages. Copies, price DM 37.50 per volume, can be ordered from DECHEMA, Frankfurt am Main, 13, Postfach, Germany.

★ ★ ★

PERNIS REFINERY EXPANSION

A throughput of 9 million tons per annum is projected for Royal Dutch/Shell's Pernis (Rotterdam) refinery for the beginning of 1954, when the new 3¼ million tons a year distillation unit is scheduled for completion.

The present crude oil distillation capacity of the refinery is 5 million tons a year; in addition, there is a yearly intake of three-quarter million tons of crude oil from the Schoonebeek (Netherlands) oilfield.

Cost of this new project, on which preliminary work has started, is estimated at £2,000,000. It will mark a further phase of the post-war reconstruction plan of the refinery which has already cost more than £20 million.

★ ★ ★

DUNKIRK REFINERY

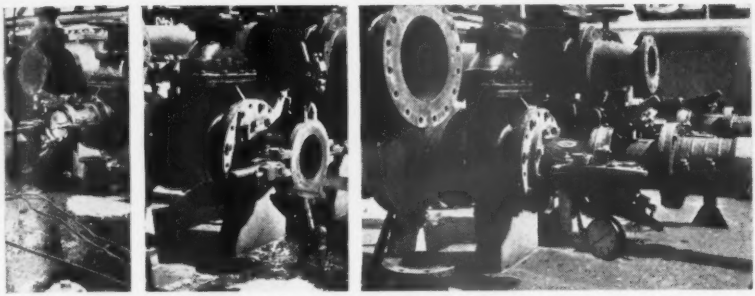
The two million tons a year Dunkirk refinery, operated by Société Générale des Huiles de Pétrole BP, is scheduled to produce annually 400,000 tons of motor spirit, 300,000 tons of gas oil, 900,000 tons of fuel oil, 100,000 tons of bitumen, 55,000 tons of lubricating oils and 40,000 tons of LPG. The refinery's plant includes two atmospheric topping units with a joint distilling capacity of 6000 tons a day and a 1400 tons/day vacuum unit.

★ ★ ★

COMMONWEALTH FUND FELLOWSHIPS

For 1953 the Commonwealth Fund, a philanthropic foundation endowed by the late Mrs Stephen V. Harkness and the late Mr and Mrs Edward S. Harkness, is offering twenty General Fellowships for study and travel in the U.S.A. to British subjects (men and women), not normally resident in the Americas and who have not previously worked or studied for more than a few months in the U.S.A. The Fellowships are open to degree graduates of a university in the U.K. of age 23 to 35, the tenure being 12 to 21 months. Details and application forms are obtainable through British Universities or from The Warden, Harkness House, 35 Portman Square, London, W.1, closing date for receipt of applications being 15 December 1952.

SPEEDING UP TANKER TURNABOUT



(Left) *The clamp closed with blank flanges as when the ship arrives in port,* (centre) *clamps open ready to receive flexible hoses, and* (right) *hoses connected.*

A new pipe clamp for coupling loading and discharge lines to the pump system of oil tankers, designed to enable the blank flanges to be removed and the flexible shore line to be connected to the tanker's loading and discharge lines in about 2½ minutes, was recently tested on board *Velutina*. With the connexions used at present, the time taken for this operation is 30-60 minutes. Devised by John Lamb, O.B.E., head of Shell's marine development and research, the clamp can be adapted for British or American standard pipes.

The device has two parts, one section comprising a hinged adjustable collar immediately behind the flange on the flexible shore line. The other consists of a short length of mild steel piping permanently bolted to the end of the intake or discharge line of the tanker. On this pipeline are four hand-operated winged arms, which hold the shore-to-ship lines in position and replace the present system of bolts and nuts and bolted clamps.

★ ★ ★

VACUUM OIL CO (IRELAND) LTD

Changes in the board of Vacuum Oil Co (Ireland) Ltd effective from 10 September 1952 are:

J. C. Gridley, C.B.E., M.Inst.Pet., chairman of Vacuum Oil Co Ltd, elected a director and chairman.

H. W. Rocke, M.Inst.Pet., and **C. Lawrie,** M.Inst.Pet., resigned from the Board.

G. B. F. Cousens, until recently automotive lubricants manager of Vacuum Oil Co Ltd, succeeds C. G. Reeves as director and manager.

J. P. Reihill, appointed a director.

M. R. Tyrrell, formerly accountant and office manager, appointed secretary.

Fullers Earth. Six brochures on the properties and uses of the products of The Fullers' Earth Union Ltd of Redhill, Surrey, have recently been issued in handy loose-leaf form in one cover.

Section 3, on activated Fullers Earth for refining mineral oils and waxes, describes methods of earth treatment based on laboratory and pilot plant tests. In section 4 is contained information on the regenerating of used mineral oils. Pretreatment is described, and then activated earth refining methods which are discussed under the headings of lubricating, turbine, and transformer oils.

★ ★ ★

Fuel Efficiency Exhibition. Arrangements are being made for the Second Fuel Efficiency Exhibition to be held in Manchester in November 1953. An advisory committee has been set up under the chairmanship of F. W. Woodfield of Messrs Babcock & Wilcox Ltd.

FORTHCOMING MEETINGS

THE INSTITUTE

Distribution of Petroleum in the U.K. The Changing Pattern. T. W. Mathias, M.A. (*Shell Mex and B.P. Ltd.*). At 26 Portland Place, London, W.1. 5.30 p.m. (*tea 5 p.m.*), 22 October.

Sulphur Compounds in Petroleum. S. F. Birch, Ph.D., A.R.C.S., D.I.C. (*Sunbury Research Station, Anglo-Iranian Oil Co. Ltd.*). At 26 Portland Place, London, W.1, 5.30 p.m. (*tea 5 p.m.*), 12 November.

Liquefied Petroleum Gases: A Symposium. Production. E. Squire, F.R.I.C., (*National Oil Refineries Ltd.*); **Distribution.** S. Shaw. (*Calor Gas (Distributing) Co. Ltd.*); **Applications.** T. H. Taylor (*Calor Gas (Distributing) Co. Ltd.*). At 26 Portland Place, London, W.1., 5.30 p.m. (*tea 5 p.m.*), 10 December.

Fawley Branch

The Kirkuk-Banias Pipeline. H. S. Gibson, C.B.E., M.A., M.I.Mech.E. (*Iraq Petroleum Co. Ltd.*). At Esso Recreation Club, Holbury. 7 30 p.m. 17 October.

London Branch

Pioneering a Refinery. The Story of Cardon, Venezuela. W. F. C. Mackie. At 26 Portland Place, London, W.1. 6 p.m. (*tea* 5.30 *p.m.*) 30 October.

Petroleum and the Law. V. Biske, B.Sc., LL.M., F.R.I.C. At 26 Portland Place, London, W.1. 6 p.m. (*tea* 5.30 *p.m.*) 26 November.

Northern Branch

Annual Dinner / Dance. At Midland Hotel, Manchester, 14 November.

Symposium on the Filling, Packaging and Handling of Petroleum Products. At Engineers' Club, Albert Square, Manchester. 6.30 p.m. 14 November.

Scottish Branch

Refinery Electrification. F. N. Beaumont, B.Sc., M.I.E.E., and G. A. McLennan. At Scottish Oils Ltd. Recreation Hall, Grangemouth. 6 November.

South-Eastern Branch

Annual Dance. At Corn Exchange, Rochester. 1 November (*Tickets 7s 6d each including buffet, from Branch Secretary*).

Bitumen and Its Uses. R. P. Bell (*Berry Wiggins & Co. Ltd.*) 4 November.

South Wales Branch

Fire Fighting in the Petroleum Industry. Chief Officer W. F. Redman, Grad.I.Fire.E. At Training Centre Cinema, National Oil Refineries Ltd., Llandarcy. 5.30 p.m. 6 November.

Stanlow Branch

Modern Methods of Motor Gasoline Manufacture. K. Owen, M.Sc. At Empire Café, Morecambe, 8.30 p.m. 23 October.

Soaring Flight. W. E. Crease. Joint meeting with Royal Aeronautical Society, At Grosvenor Hotel, Chester, 7.30 p.m. 18 November.

Dinner and Dance. At Thornton Research Centre, 7 p.m. 28 November.

OTHER SOCIETIES

Substitution Reactions at an Aromatic Carbon Atom. Prof. D. H. Hey, D.Sc., F.R.I.C. The Chemical Society. At Chemistry Dept., University College, Dundee, 5.15, 23 October; also at Royal Technical College, Glasgow, 3.30 p.m. 24 October.

★ ★ ★

APPOINTMENTS VACANT

ESSO PETROLEUM COMPANY LIMITED, Refinery Department, Fawley, Hants, have the following vacancies for graduate staff:

(A) Chemical Engineers and Mechanical Engineers

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(B) Chemists

There are also a limited number of vacancies for Chemists with a good degree and a minimum of three years industrial experience in the Petroleum or allied industry. The duties will cover the work of quality control in the Laboratory.

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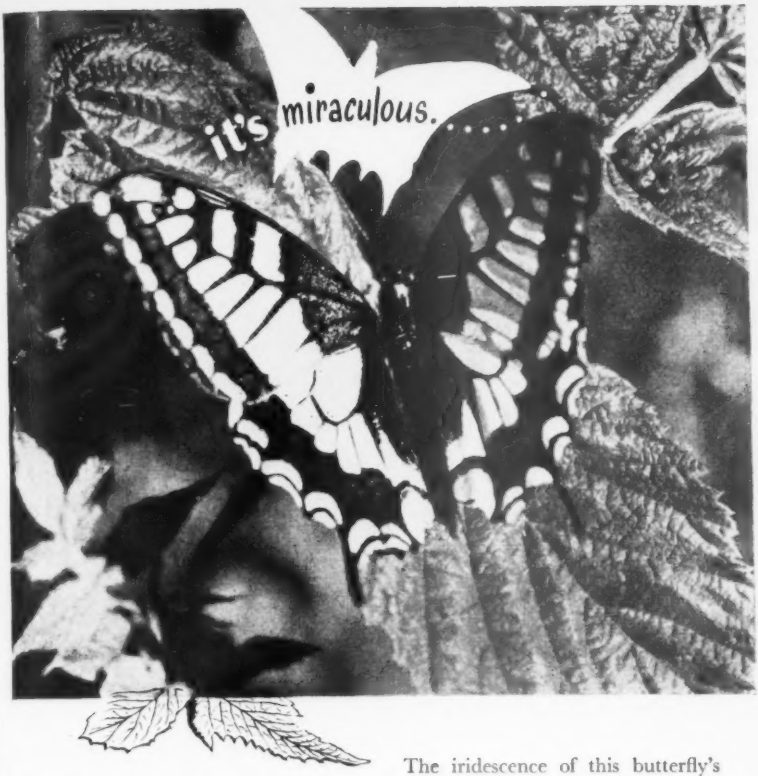

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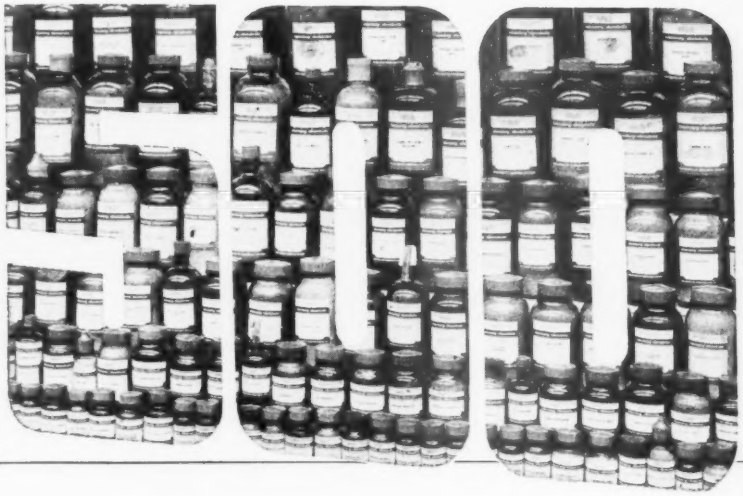

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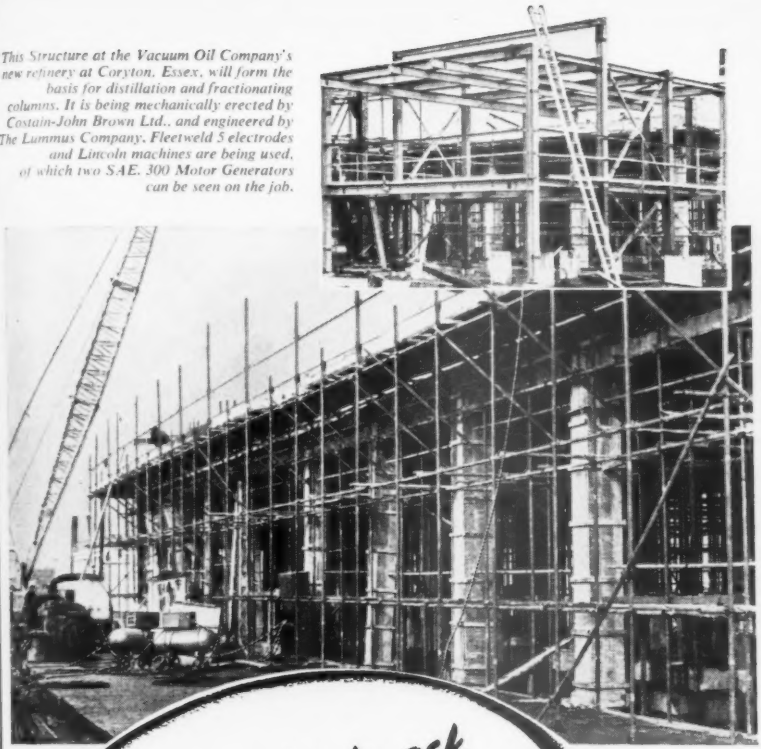
This Structure at the Vacuum Oil Company's new refinery at Coryton, Essex, will form the basis for distillation and fractionating columns. It is being mechanically erected by Costain-John Brown Ltd., and engineered by The Lummus Company. Fleetweld 5 electrodes and Lincoln machines are being used, of which two SAE. 300 Motor Generators can be seen on the job.



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